

CELL STRUCTURE AND FUNCTION

Chapter 7

Ch 7.1: Life is Cellular

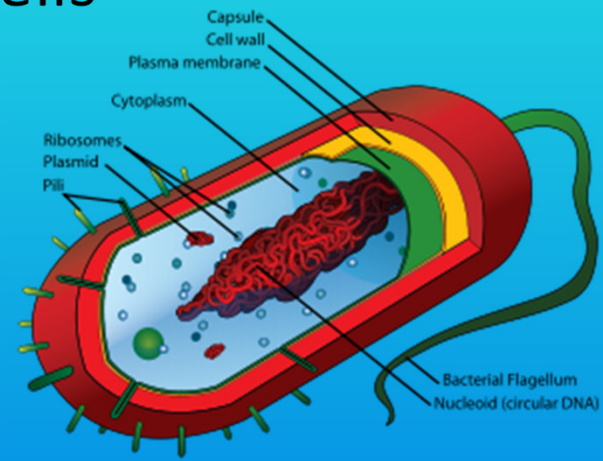
- **Cell** = Basic unit of life
- All cells have
 - **Cell membrane** =
 - Thin, flexible barrier surrounding cell
 - Controls what enters and leaves cell
 - **Cytoplasm** =
 - Jelly-like fluid inside cell
 - **Ribosomes** =
 - Site of protein synthesis
 - Found throughout cytoplasm
 - DNA
 - Genetic material of the cell

- **Prokaryotes** =

- Unicellular organisms that lack a nucleus
- DNA is found in cytoplasm
- Generally smaller and simpler cells
- Ex: Bacteria

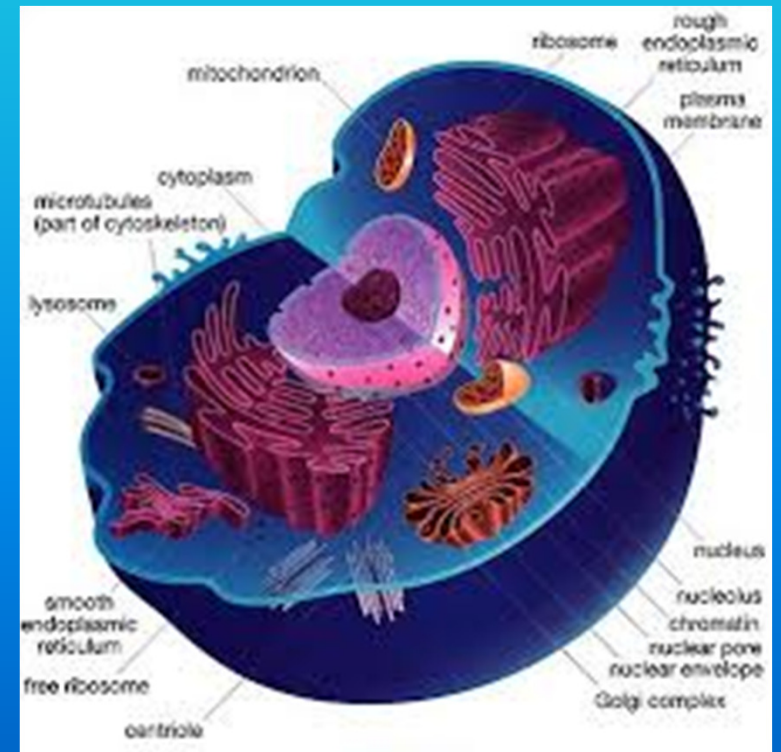
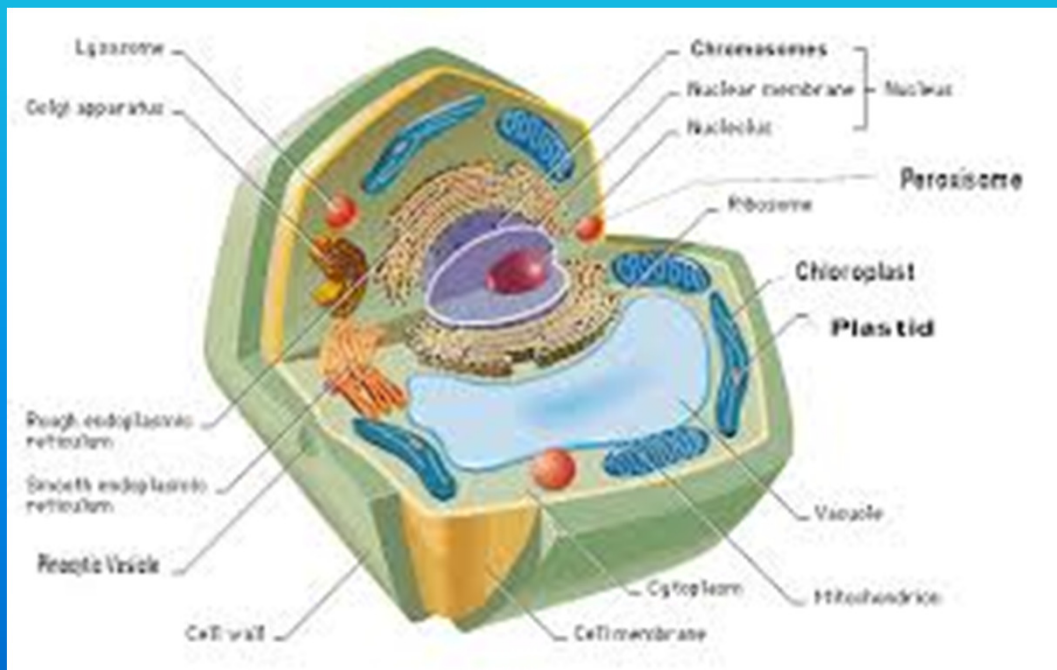
- **Eukaryotes** =

- Cells contain a nucleus
- DNA is enclosed within nucleus
- Generally larger and more complex
- Ex: Protists (unicellular);
Fungi, Plants, Animals (multicellular)



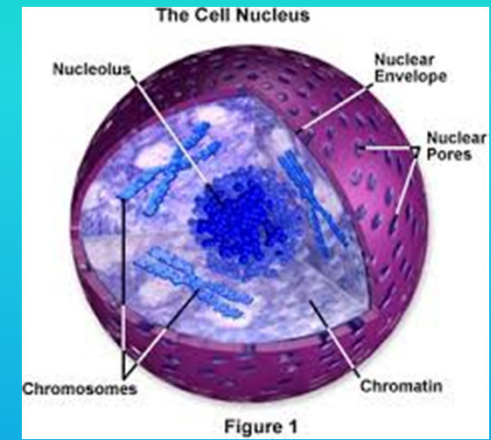
Ch 7.2: Cell Structure

- **Organelle** = specialized part of a cell that performs specific functions



Cellular Control Center

- **Nucleus** =
 - Control center of the cell
 - Contains **chromosomes** =
 - Carry genetic information (DNA)
 - Surrounded by a **nuclear envelope** =
 - Controls what moves into and out of nucleus
 - Contains **nucleolus** =
 - Manufactures ribosomes



Store, Clean, Support

- **Vacuoles** =
 - Store water, salts, proteins, and carbohydrates
 - Plants: Large central vacuole
- **Vesicles** =
 - Store and move materials between organelles and cell surface
- **Lysosomes** =
 - Vesicles containing digestive enzymes that clean up the cell
 - Typically found only in animal cells

- **Cytoskeleton** =

- Helps cell maintain shape
- Involved in movement of and within cell
- Consists of

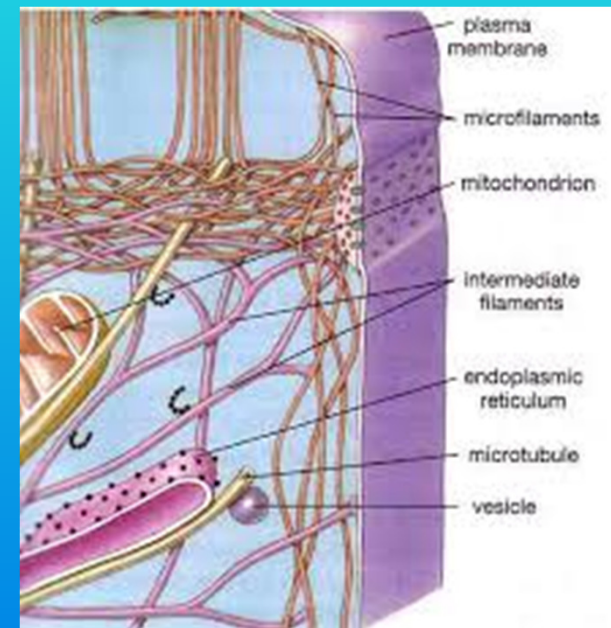
- Microfilaments

- Microtubules

- Form components of cilia and flagella

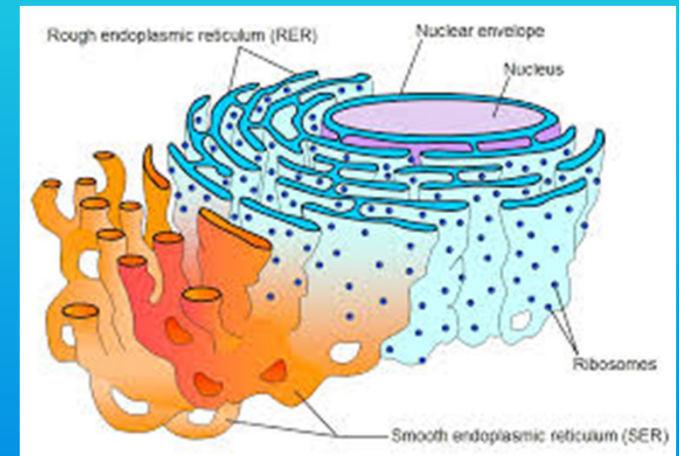
- In animal cells, form **centrioles** =

- » Facilitate movement of chromosomes during cell division

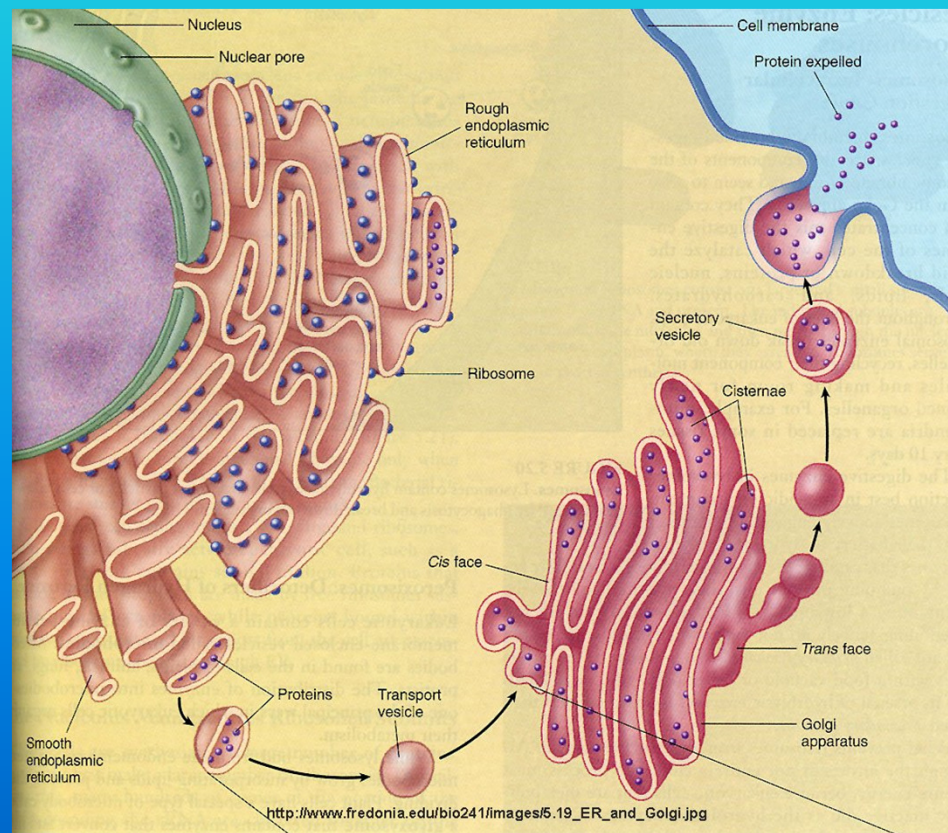


Build Proteins

- **Ribosomes** =
 - Proteins are produced here
 - Found attached to rough ER or free in the cytoplasm
- **Endoplasmic reticulum** =
 - Internal membrane system that transports lipids and proteins
 - Rough ER has ribosomes attached to it
 - Exports proteins
 - Smooth ER does not have ribosomes
 - Involved in lipid synthesis and detoxification of drugs



- **Golgi apparatus** =
 - Modifies, sorts, and packages proteins and lipids from the ER



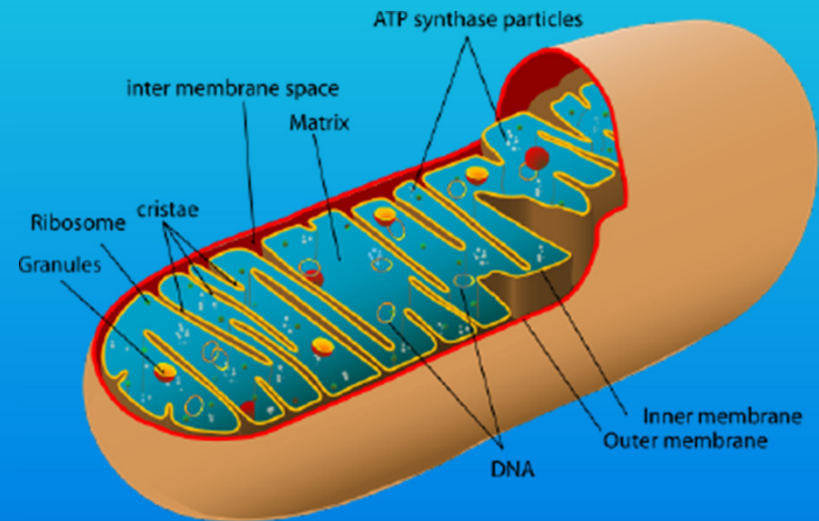
Capture and Release Energy

- **Chloroplasts** =

- Convert energy from sunlight into chemical energy (glucose) through photosynthesis
- Found in plants

- **Mitochondria** =

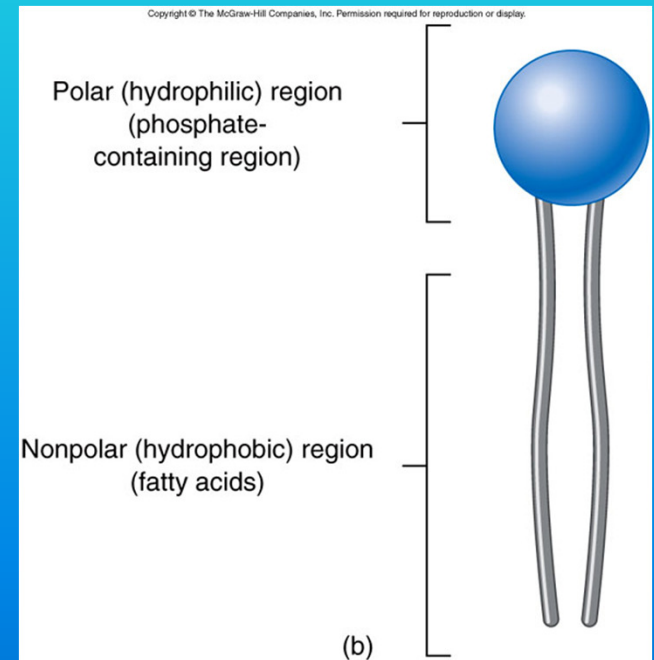
- Convert chemical energy from food into ATP during respiration
- **Cristae** =
 - Numerous folds of the inner membrane
 - Increase surface area to produce more ATP



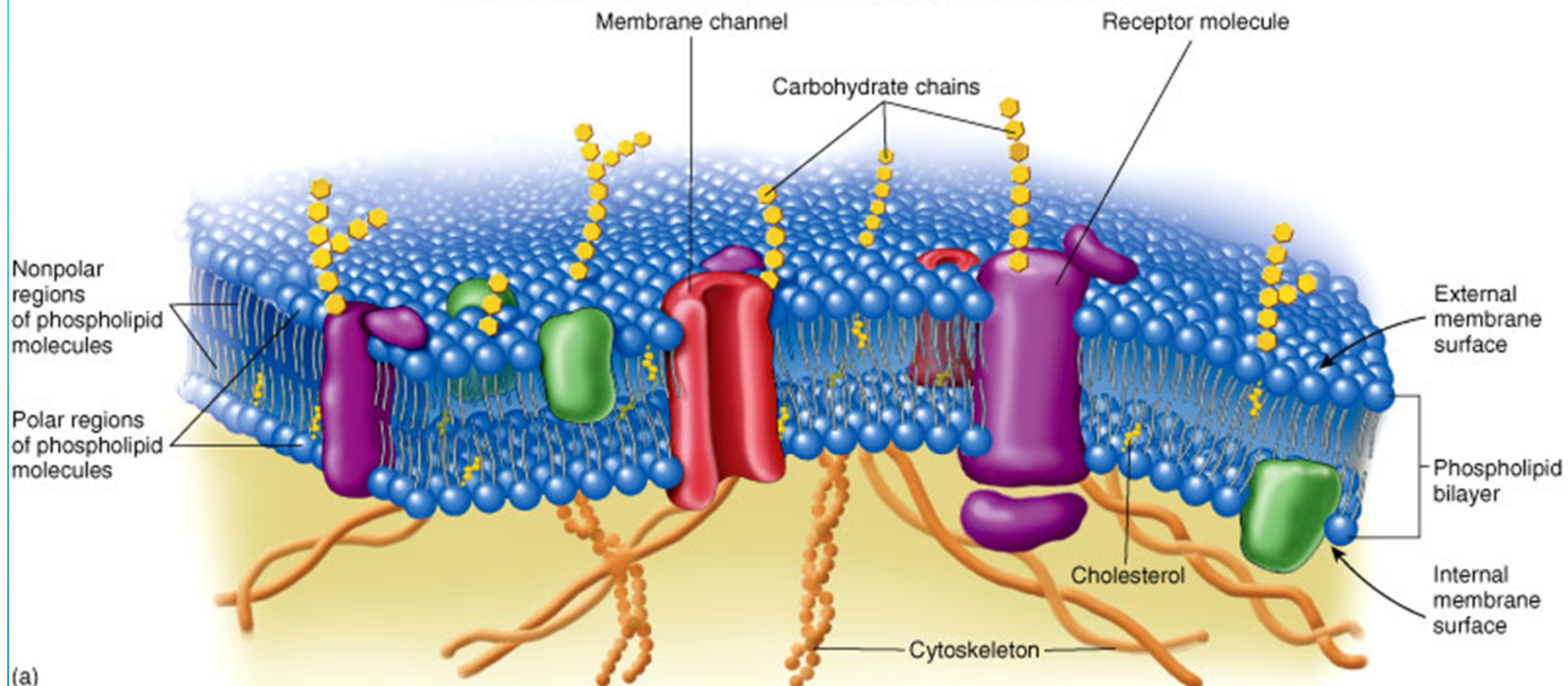
Cellular Boundaries

- **Cell wall** =
 - Supports, shapes, and protects cell
 - Found in prokaryotes and plant cells
 - NOT found in animal cells
- **Cell membrane** =
 - Protective barrier that regulates what enters and leaves cell
 - Selectively (or semi) permeable
 - Composed of lipid bilayer

- Fluid Mosaic Model
 - Cell membrane contains a double layer of phospholipids
 - Phosphate “head” is polar and is attracted to water
 - Hydrophilic =
 - » Water loving
 - Fatty acid “tails” are nonpolar and are repelled by water
 - Hydrophobic =
 - » Water fearing
 - Also contains proteins and carbohydrates



Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Ch 7.3: Cell Transport

- **Passive Transport** =

- Movement of materials across cell membrane from ***high to low*** concentration
- Does NOT require energy

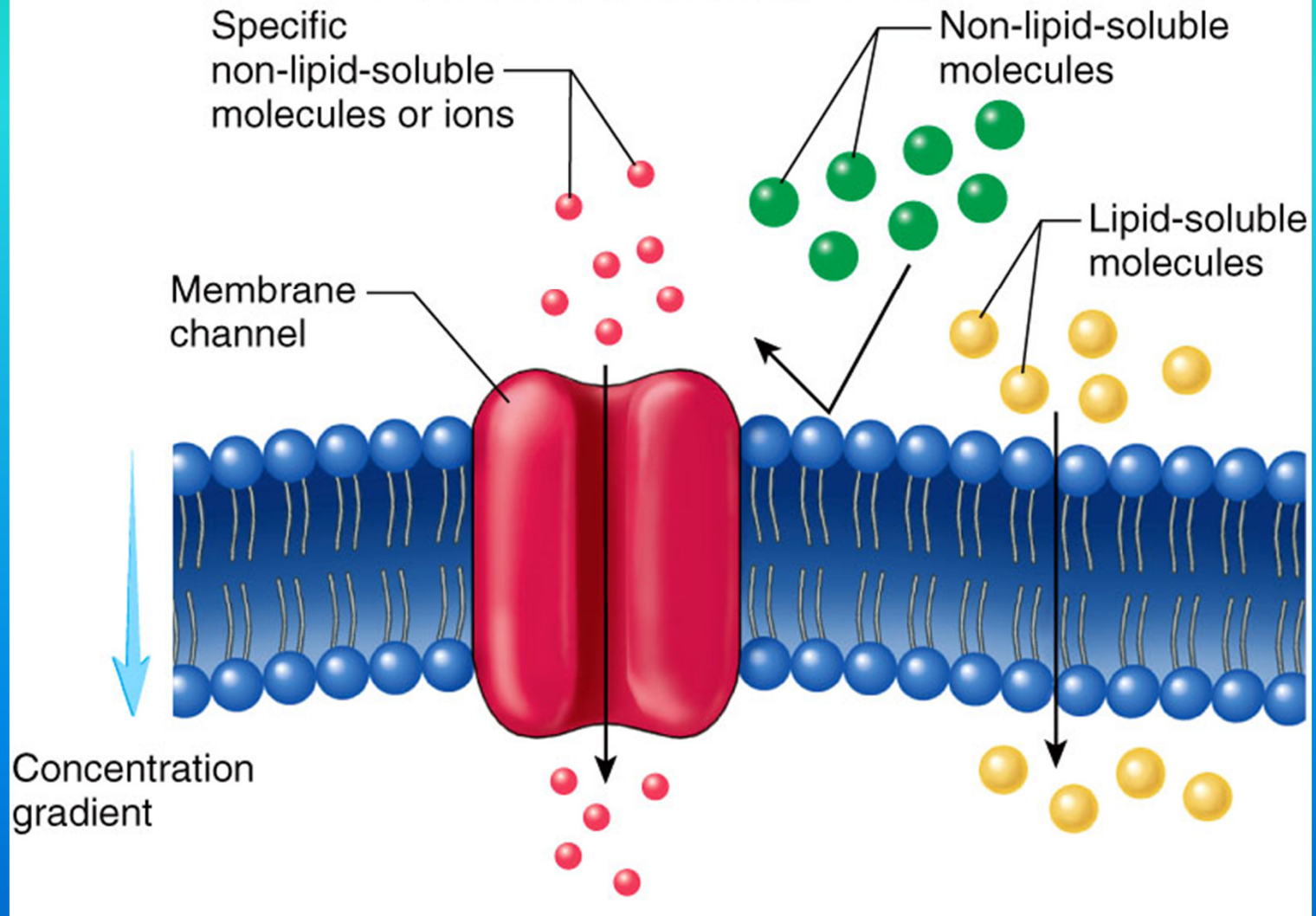
1. **Diffusion** =

- Movement of solute from ***high to low*** concentration

2. **Facilitated diffusion** =

- Molecules pass from ***high to low*** through membrane channels

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

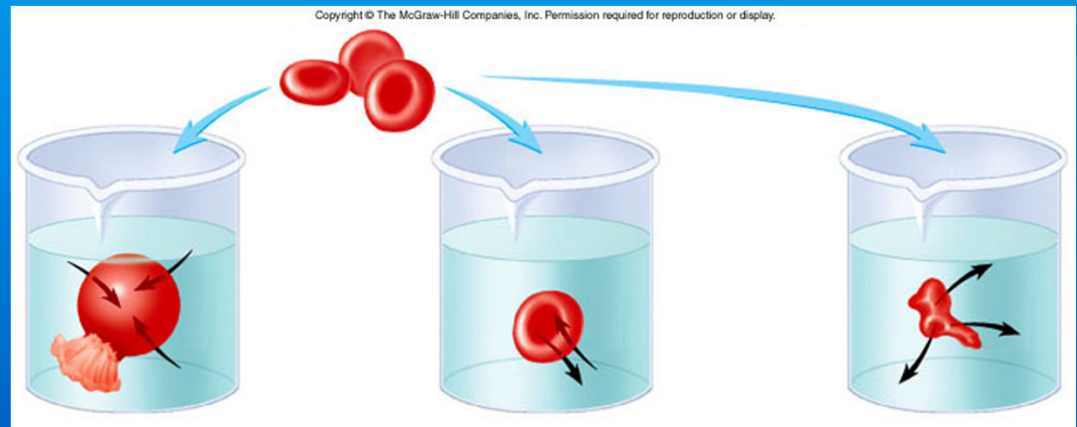


3. Osmosis =

- The diffusion of water across a selectively permeable membrane
- Water moves from ***high to low***

- Isotonic solution=

- Concentrations of solutes and water are the same on both sides of the cell membrane
- Cells neither swell nor shrink



- **Hypertonic solution**=

- Higher concentration of solutes and a lower concentration of water outside the cell
- Water moves out of the cell
- **Crenation** = cell shrinks

- **Hypotonic solution**=

- Lower concentration of solutes and a higher concentration of water outside the cell
- Water moves into the cell
- **Lysis** = cell ruptures

- **Active Transport =**

- Movement of materials from **low to high** concentration

- Requires **energy!**

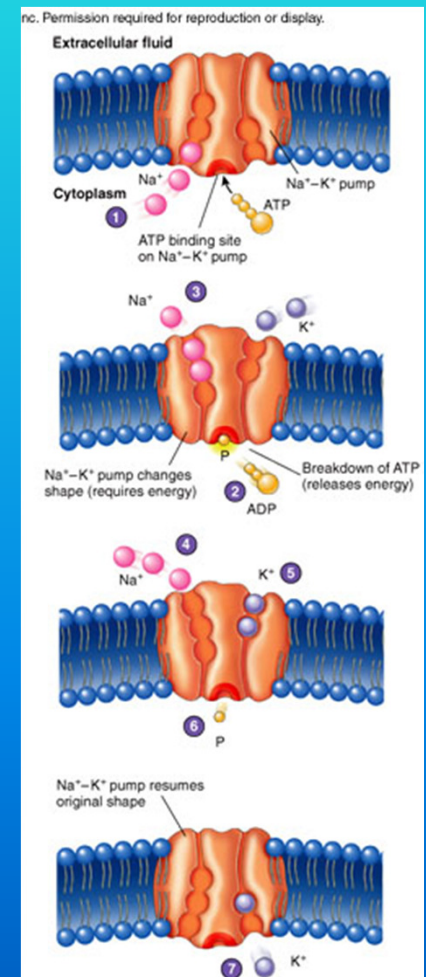
- 1. Molecular transport via protein pumps

- ATP provides necessary energy

- Ex: Sodium-potassium pump

- Moves Na^+ out of cells

- Moves K^+ into cells



2. Bulk Transport

- **Endocytosis** =

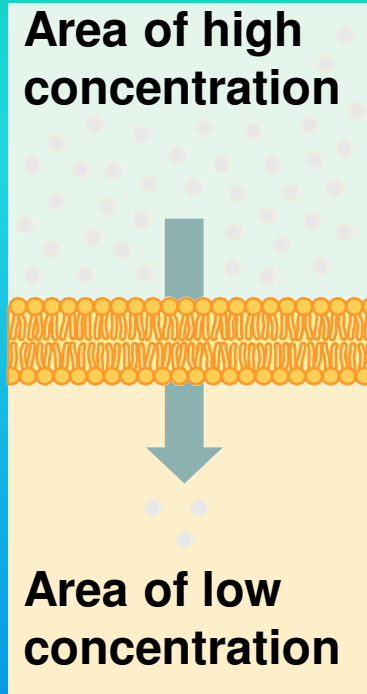
- Taking material into cell through formation of vesicles

- **Exocytosis** =

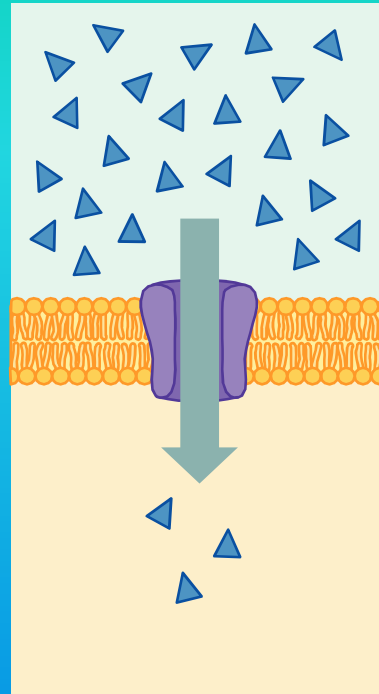
- Elimination of material from a cell through the formation of vesicles

Transport Moves Substances

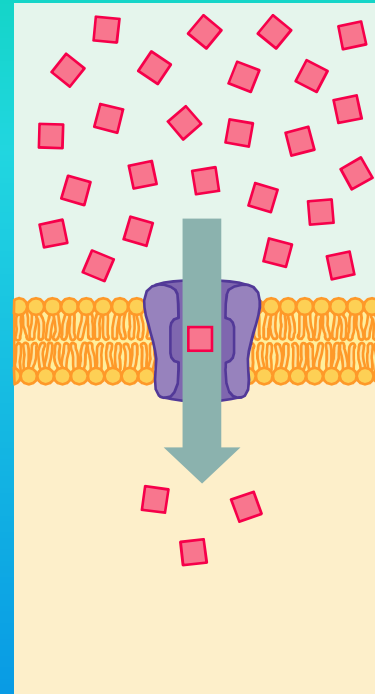
Slide number: 1



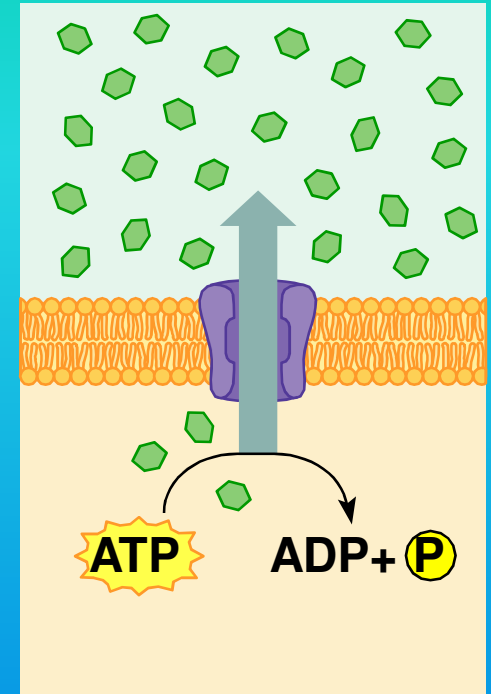
A Simple diffusion



B Facilitated diffusion—channel



C Facilitated diffusion—carrier



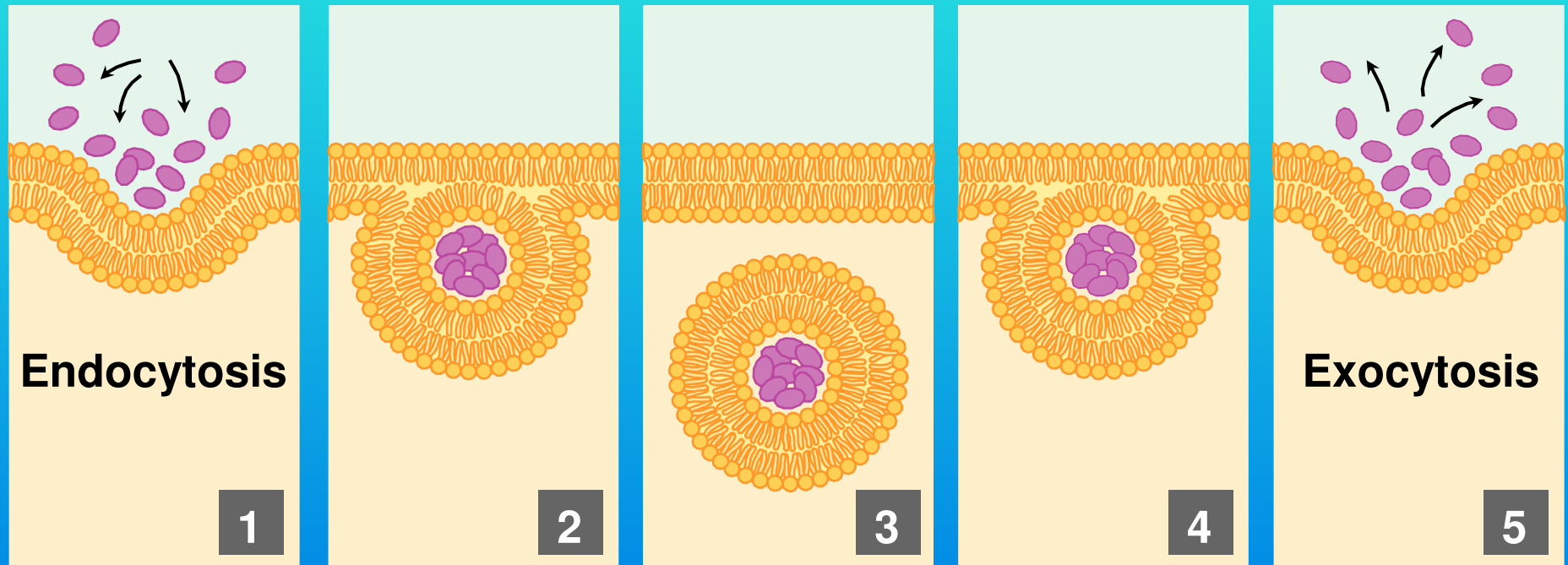
D

Passive transport
No energy required

Active transport
Energy required

Endocytosis and Exocytosis

Slide number: 1



Ch 7.4: Homeostasis and Cells

- **Homeostasis** = (“homeo” means “the same”)
 - Relatively constant internal physical and chemical conditions that organisms maintain
- To maintain homeostasis
 - Unicellular organisms
 - ~Grow
 - ~Respond to environment
 - ~Reproduce~Transform energy
 - Cells of multicellular organisms work together
 - Cells are organized into **tissues**
 - Tissues are organized into **organs**
 - Organs are organized into **organ systems**